

## Table of Contents

### Chapter 1 – Introduction

1.1	Introduction.....	1-1
1.2	Purpose and Need for Action .....	1-4
1.3	Scope of the ROS.....	1-5
1.4	Decisions To Be Made .....	1-6
1.5	History of Policy Changes .....	1-6
1.6	Scoping Process.....	1-7
1.6.1	Public Involvement .....	1-8
1.6.2	Results of the Scoping Process .....	1-9
1.7	Statutory Overview .....	1-13
1.7.1	Tennessee Valley Authority Act .....	1-13
1.7.2	National Environmental Policy Act.....	1-14
1.7.3	Protection of Water Quality .....	1-14
1.7.4	Protection of Wetlands and Floodplains .....	1-14
1.7.5	Protection of Air Quality.....	1-15
1.7.6	Protection of Threatened and Endangered Species .....	1-15
1.7.7	Protection of Cultural Resources.....	1-15
1.7.8	Protection of Farmland .....	1-16
1.7.9	Environmental Justice .....	1-16
1.7.10	Homeland Security Act.....	1-16
1.7.11	Other Regulations and Executive Orders .....	1-16
1.8	Relationship with Other NEPA Reviews .....	1-17
1.9	EIS Overview .....	1-18

### Chapter 2 – The Water Control System

2.1	Background and Water Control System Overview .....	2-1
2.1.1	Rainfall and Runoff.....	2-1
2.1.2	Structure of the Water Control System.....	2-2
2.2	Water Control System Description .....	2-7
2.2.1	Flows through the Water Control System.....	2-7
2.2.2	Balancing Operating Objectives .....	2-9
2.2.3	Reservoir Operations Policy.....	2-10
2.3	Existing Water Control System Operations .....	2-18
2.3.1	Operations for Navigation.....	2-18
2.3.2	Operations for Flood Control .....	2-20
2.3.3	Operations for Power Production .....	2-21
2.3.4	Operations for Recreation .....	2-23
2.3.5	Operations for Water Supply .....	2-24
2.3.6	Operations for Water Quality .....	2-25
2.3.7	Operations for Other Objectives .....	2-25
2.3.8	System Monitoring and Decision Support .....	2-27

# Table of Contents

---

## Chapter 3 – Reservoir Operations Policy Alternatives

3.1	Introduction .....	3-1
3.2	Alternatives Development Process .....	3-2
3.2.1	Formulating Policy Alternatives .....	3-2
3.2.2	Screening Preliminary Policy Alternatives .....	3-3
3.2.3	Selecting Policy Alternatives .....	3-4
3.3	Alternatives Evaluated in Detail .....	3-5
3.3.1	Base Case .....	3-10
3.3.2	Reservoir Recreation Alternative A .....	3-12
3.3.3	Reservoir Recreation Alternative B .....	3-13
3.3.4	Summer Hydropower Alternative .....	3-15
3.3.5	Equalized Summer/Winter Flood Risk Alternative .....	3-16
3.3.6	Commercial Navigation Alternative .....	3-16
3.3.7	Tailwater Recreation Alternative .....	3-18
3.3.8	Tailwater Habitat Alternative .....	3-19
3.4	Other Actions Considered .....	3-20
3.4.1	Actions That Exist or Could be Implemented Independent of a Change in the Reservoir Operations Policy .....	3-20
3.4.2	Actions Not Included in Any Policy Alternative .....	3-22
3.5	Comparison of Alternatives .....	3-25
3.5.1	Objectives Identified during Scoping .....	3-25
3.5.2	Impacts on Resource Areas .....	3-28
3.5.3	Regional Economic Effects .....	3-38
3.5.4	Development of a Preferred Alternative .....	3-39

## Chapter 4 – Description of the Affected Environment

4.1	Introduction to Affected Environment .....	4.1-1
4.1.1	Organization of Resource-Specific Sections .....	4.1-1
4.1.2	Reservoir and Waterbody Classifications .....	4.1-3
4.1.4	General Setting .....	4.1-4
4.2	Air Resources .....	4.2-1
4.2.1	Introduction .....	4.2-1
4.2.2	Regulatory Programs and TVA Management Activities .....	4.2-1
4.2.3	Existing Conditions .....	4.2-2
4.2.4	Expected Future Changes in Emissions .....	4.2-11
4.3	Climate .....	4.3-1
4.3.1	Introduction .....	4.3-1
4.3.2	Regulatory Programs and TVA Management Activities .....	4.3-1
4.3.3	Existing Conditions .....	4.3-2
4.3.4	Emissions of Greenhouse Gases .....	4.3-3
4.4	Water Quality .....	4.4-1
4.4.1	Introduction .....	4.4-1
4.4.2	Regulatory Programs and TVA Management Activities .....	4.4-2
4.5	Water Supply .....	4.5-1
4.5.1	Introduction .....	4.5-1
4.5.2	Regulatory Programs and TVA Management Activities .....	4.5-2
4.5.3	Water Supply Availability .....	4.5-2
4.5.4	Water Supply Pumping Requirements .....	4.5-5
4.5.5	Water Supply Quality and Treatment .....	4.5-6

4.6	Groundwater Resources.....	4.6-1
4.6.1	Introduction.....	4.6-1
4.6.2	Regulatory Programs and TVA Management Activities .....	4.6-1
4.6.3	Geology and Hydrogeology of the Tennessee Valley .....	4.6-1
4.6.4	Groundwater Use .....	4.6-2
4.7	Aquatic Resources .....	4.7-1
4.7.1	Introduction.....	4.7-1
4.7.2	Regulatory Programs and TVA Management Activities .....	4.7-2
4.7.3	General Description of Aquatic Resources .....	4.7-6
4.7.4	Reservoir Biodiversity.....	4.7-9
4.7.5	Tailwater Biodiversity .....	4.7-15
4.7.6	Commercial Fishing Operations .....	4.7-18
4.7.7	Commercial Mussel Operations .....	4.7-19
4.7.8	Sport Fisheries .....	4.7-20
4.8	Wetlands.....	4.8-1
4.8.1	Introduction.....	4.8-1
4.8.2	Regulatory Programs and TVA Management Activities .....	4.8-1
4.8.3	Wetland Location.....	4.8-2
4.8.4	Wetland Type .....	4.8-7
4.8.5	Wetland Functions.....	4.8-13
4.9	Aquatic Plants.....	4.9-1
4.9.1	Introduction.....	4.9-1
4.9.2	Regulatory Programs and TVA Management Activities .....	4.9-10
4.9.3	Coverage of Aquatic Plants .....	4.9-10
4.10	Terrestrial Ecology.....	4.10-1
4.10.1	Introduction.....	4.10-1
4.10.2	Regulatory Programs and TVA Management Activities .....	4.10-2
4.10.3	Lowland Plant Communities.....	4.10-6
4.10.4	Upland Plant Communities.....	4.10-8
4.10.5	Wildlife Communities.....	4.10-9
4.11	Invasive Terrestrial and Aquatic Animals and Terrestrial Plants .....	4.11-1
4.11.1	Introduction.....	4.11-1
4.11.2	Regulatory Programs and TVA Management Activities .....	4.11-2
4.11.3	Population Abundance and Spread of Invasive Terrestrial Animals and Plants.....	4.11-2
4.11.4	Population Abundance and Spread of Invasive Aquatic Animals.....	4.11-3
4.12	Vector Control.....	4.12-1
4.12.1	Introduction.....	4.12-1
4.12.2	Regulatory Programs and TVA Management Activities .....	4.12-2
4.12.3	Population Abundance of Permanent Pool Species.....	4.12-3
4.12.4	Population Abundance of Floodwater Species.....	4.12-4
4.13	Threatened and Endangered Species.....	4.13-1
4.13.1	Introduction.....	4.13-1
4.13.2	Regulatory and TVA Management Activities .....	4.13-2
4.13.3	Occurrence Patterns .....	4.13-2
4.14	Managed Areas and Ecologically Significant Sites.....	4.14-1
4.14.1	Introduction.....	4.14-1
4.14.2	Regulatory Programs and TVA Management Activities .....	4.14-2

## Table of Contents

---

4.14.3	Managed Area Integrity of Reservoir- and Tailwater-Dependent Sites .....	4.14-5
4.15	Land Use .....	4.15-1
4.15.1	Introduction.....	4.15-1
4.15.2	Regulatory Programs and TVA Management Activities .....	4.15-2
4.15.3	Shoreline Residential Development .....	4.15-3
4.16	Shoreline Erosion .....	4.16-1
4.16.1	Introduction.....	4.16-1
4.16.2	Regulatory Programs and TVA Management Activities .....	4.16-2
4.16.3	Reservoir Shoreline Erosion Conditions.....	4.16-3
4.16.4	Tailwater Shoreline Erosion Conditions .....	4.16-5
4.17	Prime Farmland .....	4.17-1
4.17.1	Introduction.....	4.17-1
4.17.2	Regulatory Programs and TVA Management Activities .....	4.17-1
4.17.3	Farmland Conversion .....	4.17-3
4.18	Cultural Resources .....	4.18-1
4.18.1	Introduction.....	4.18-1
4.18.2	Regulatory Programs and TVA Management Activities .....	4.18-2
4.18.3	Archaeological Sites .....	4.18-2
4.18.4	Historic Structures .....	4.18-6
4.19	Visual Resources.....	4.19-1
4.19.1	Introduction.....	4.19-1
4.19.2	Regulatory Programs and TVA Management Activities .....	4.19-2
4.19.3	Descriptions of Scenic Value.....	4.19-3
4.19.4	Barren Drawdown Zone or Shoreline Ring.....	4.19-8
4.19.5	Exposure of Reservoir Bottoms and Flats .....	4.19-10
4.19.6	Shoreline Development .....	4.19-13
4.20	Dam Safety.....	4.20-1
4.20.1	Introduction.....	4.20-1
4.20.2	Regulatory Programs and TVA Management Activities .....	4.20-1
4.20.3	Seismology .....	4.20-1
4.20.4	Reservoir Levels.....	4.20-2
4.20.5	Reservoir Drawdown Rates.....	4.20-3
4.20.6	Leakage.....	4.20-3
4.21	Navigation.....	4.21-1
4.21.1	Introduction.....	4.21-1
4.21.2	Regulatory Programs and TVA Management Activities .....	4.21-3
4.21.3	Cargo Movements on the Tennessee River .....	4.21-3
4.22	Flood Control .....	4.22-1
4.22.1	Introduction.....	4.22-1
4.22.2	Regulatory Programs and TVA Management Activities .....	4.22-1
4.22.3	Peak Flows and Frequency .....	4.22-2
4.22.4	Potential Flood Damage .....	4.22-7
4.22.5	Flood Recovery .....	4.22-8
4.22.6	Future Trends .....	4.22-9
4.23	Power .....	4.23-1
4.23.1	Introduction.....	4.23-1
4.23.2	Regulatory Programs and TVA Management Activities .....	4.23-2
4.23.3	Power Generation Dispatch .....	4.23-3
4.23.4	Power System Reliability .....	4.23-8

	4.23.5	Coal and Nuclear Unit Derates .....	4.23-8
4.24		Recreation .....	4.24-1
	4.24.1	Introduction.....	4.24-1
	4.24.2	Regulatory Programs and TVA Management Activities .....	4.24-4
	4.24.3	Recreation use .....	4.24-4
4.25		Social and Economic Resources.....	4.25-1
	4.25.1	Introduction.....	4.25-1
	4.25.2	Regulatory Programs and TVA Management Activities .....	4.25-2
	4.25.3	Environmental Justice .....	4.25-10
	4.25.4	Direct Economic Drivers .....	4.25-12

## Chapter 5 – Environmental Consequences of the Alternatives

5.1		Introduction to Environmental Consequences .....	5.1-1
	5.1.1	Organization of Resource Areas Sections .....	5.1-1
	5.1.2	Weekly Scheduling Model .....	5.1-1
5.2		Air Resources .....	5.2-1
	5.2.1	Introduction.....	5.2-1
	5.2.2	Assessment Methodology and Results .....	5.2-1
	5.2.3	Base Case .....	5.2-2
	5.2.4	Reservoir Recreation Alternative A .....	5.2-2
	5.2.5	Reservoir Recreation Alternative B .....	5.2-6
	5.2.6	Summer Hydropower Alternative.....	5.2-6
	5.2.7	Equalized Summer/Winter Flood Risk Alternative.....	5.2-6
	5.2.8	Commercial Navigation Alternative .....	5.2-7
	5.2.9	Tailwater Recreation Alternative .....	5.2-7
	5.2.10	Tailwater Habitat Alternative .....	5.2-7
	5.2.11	Summary of Impacts .....	5.2-8
5.3		Climate .....	5.3-1
	5.3.1	Impact Assessment Methods .....	5.3-1
	5.3.2	Base Case .....	5.3-2
	5.3.3	Reservoir Recreation Alternative A .....	5.3-2
	5.3.4	Reservoir Recreation Alternative B .....	5.3-3
	5.3.5	Summer Hydropower Alternative.....	5.3-3
	5.3.6	Equalized Summer/Winter Flood Risk.....	5.3-3
	5.3.7	Commercial Navigation Alternative .....	5.3-3
	5.3.8	Tailwater Recreation Alternative .....	5.3-3
	5.3.9	Tailwater Habitat Alternative .....	5.3-4
	5.3.10	Summary of Impacts .....	5.3-4
5.4		Water Quality.....	5.4-1
	5.4.1	Introduction.....	5.4-1
	5.4.2	Impact Assessment Methods .....	5.4-2
	5.4.3	Base Case .....	5.4-11
	5.4.4	Reservoir Recreation Alternative A .....	5.4-12
	5.4.5	Reservoir Recreation Alternative B .....	5.4-13
	5.4.6	Summer Hydropower Alternative.....	5.4-14
	5.4.7	Equalized Summer/Winter Flood Risk Alternative.....	5.4-14
	5.4.8	Commercial Navigation Alternative .....	5.4-15
	5.4.9	Tailwater Recreation Alternative .....	5.4-15
	5.4.10	Tailwater Habitat Alternative .....	5.4-16
	5.4.11	Impacts of Policy Alternatives on Algae .....	5.4-16

# Table of Contents

---

	5.4.12	General Water Quality Impacts .....	5.4-17
	5.4.13	Assimilative Capacity and Anoxic Products.....	5.4-17
5.5		Water Supply .....	5.5-1
	5.5.1	Introduction.....	5.5-1
	5.5.2	Impact Assessment Methods .....	5.5-1
	5.5.3	Base Case .....	5.5-9
	5.5.4	All Policy Alternatives .....	5.5-9
	5.5.5	Summary of Impacts .....	5.5-11
5.6		Groundwater Resources.....	5.6-1
	5.6.1	Introduction.....	5.6-1
	5.6.2	Impact Assessment Methods .....	5.6-1
	5.6.3	Base Case .....	5.6-3
	5.6.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative—Reservoirs .....	5.6-3
	5.6.5	Summer Hydropower Alternative, Equalized Summer/Winter Flood Risk Alternative, and Commercial Navigation Alternative—Reservoirs.....	5.6-4
	5.6.6	All Policy Alternatives—Tailwaters .....	5.6-4
	5.6.7	Summary of Impacts .....	5.6-4
5.7		Aquatic Resources .....	5.7-1
	5.7.1	Introduction.....	5.7-1
	5.7.2	Impact Assessment Methods .....	5.7-1
	5.7.3	Base Case .....	5.7-20
	5.7.4	Reservoir Recreation Alternative A .....	5.7-21
	5.7.5	Reservoir Recreation Alternative B .....	5.7-23
	5.7.6	Summer Hydropower Alternative.....	5.7-24
	5.7.7	Equalized Summer/Winter Flood Risk Alternative.....	5.7-26
	5.7.8	Commercial Navigation Alternative .....	5.7-27
	5.7.9	Tailwater Recreation Alternative .....	5.7-27
	5.7.10	Tailwater Habitat Alternative .....	5.7-28
	5.7.11	Summary of Impacts .....	5.7-29
5.8		Wetlands.....	5.8-1
	5.8.1	Introduction.....	5.8-1
	5.8.2	Impact Assessment Methods .....	5.8-1
	5.8.3	Base Case .....	5.8-3
	5.8.4	Reservoir Recreation Alternative A and Tailwater Habitat Alternative .....	5.8-3
	5.8.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.8-4
	5.8.6	Summer Hydropower Alternative.....	5.8-5
	5.8.7	Equalized Summer/Winter Flood Risk Alternative.....	5.8-6
	5.8.8	Commercial Navigation Alternative .....	5.8-8
	5.8.9	Summary of Impacts .....	5.8-8
5.9		Aquatic Plants.....	5.9-1
	5.9.1	Introduction.....	5.9-1
	5.9.2	Impact Assessment Methods .....	5.9-1
	5.9.3	Base Case .....	5.9-2
	5.9.4	Commercial Navigation Alternative .....	5.9-2

5.9.5	Reservoir Recreation Alternative A and Tailwater Habitat Alternative .....	5.9-2
5.9.6	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.9-3
5.9.7	Summer Hydropower Alternative.....	5.9-3
5.9.8	Equalized Summer/Winter Flood Risk Alternative.....	5.9-3
5.9.9	Summary of Impacts .....	5.9-4
5.10	Terrestrial Ecology.....	5.10-1
5.10.1	Introduction.....	5.10-1
5.10.2	Impact Assessment Methods .....	5.10-1
5.10.3	Base Case .....	5.10-2
5.10.4	Commercial Navigation Alternative .....	5.10-2
5.10.5	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.10-3
5.10.6	Summer Hydropower Alternative.....	5.10-4
5.10.7	Equalized Summer/Winter Flood Risk Alternative.....	5.10-5
5.10.8	Summary of Impacts .....	5.10-6
5.11	Invasive Plants and Animals.....	5.11-1
5.11.1	Introduction.....	5.11-1
5.11.2	Impact Assessment Methods .....	5.11-1
5.11.3	Base Case .....	5.11-2
5.11.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, and Tailwater Recreation Alternative.....	5.11-2
5.11.5	Summer Hydropower Alternative.....	5.11-3
5.11.6	Commercial Navigation Alternative .....	5.11-3
5.11.7	Tailwater Habitat Alternative .....	5.11-4
5.11.8	Summary of Impacts .....	5.11-4
5.12	Vector Control.....	5.12-1
5.12.1	Introduction.....	5.12-1
5.12.2	Impact Assessment Methods .....	5.12-1
5.12.3	Base Case .....	5.12-1
5.12.4	Summer Hydropower Alternative.....	5.12-2
5.12.5	Commercial Navigation Alternative .....	5.12-2
5.12.6	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.12-2
5.12.7	Summary of Impacts .....	5.12-3
5.13	Threatened and Endangered Species.....	5.13-1
5.13.1	Introduction.....	5.13-1
5.13.2	Impact Assessment Methods .....	5.13-1
5.13.3	Base Case .....	5.13-14
5.13.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, and Tailwater Recreation Alternative .....	5.13-15
5.13.5	Equalized Summer/Winter Flood Risk Alternative and Tailwater Habitat Alternative .....	5.13-16
5.13.6	Commercial Navigation Alternative .....	5.13-16
5.13.7	Summer Hydropower Alternative.....	5.13-17

# Table of Contents

---

5.13.8	Summary of Impacts .....	5.13-18
5.14	Managed Areas and Ecologically Significant Sites.....	5.14-1
5.14.1	Introduction.....	5.14-1
5.14.2	Impact Assessment Methods .....	5.14-1
5.14.3	Base Case .....	5.14-2
5.14.4	Commercial Navigation Alternative .....	5.14-2
5.14.5	Reservoir Recreation Alternative A and Tailwater Habitat Alternative .....	5.14-3
5.14.6	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.14-3
5.14.7	Summer Hydropower Alternative.....	5.14-4
5.14.8	Equalized Summer/Winter Flood Risk Alternative.....	5.14-4
5.14.9	Summary of Impacts .....	5.14-5
5.15	Land Use .....	5.15-1
5.15.1	Introduction.....	5.15-1
5.15.2	Impact Assessment Methods .....	5.15-1
5.15.3	Base Case .....	5.15-3
5.15.4	Reservoir Recreation Alternative A .....	5.15-3
5.15.5	Reservoir Recreation Alternative B .....	5.15-4
5.15.6	Summer Hydropower Alternative.....	5.15-4
5.15.7	Equalized Summer/Winter Flood Risk Alternative.....	5.15-4
5.15.8	Commercial Navigation Alternative .....	5.15-4
5.15.9	Tailwater Recreation Alternative .....	5.15-4
5.15.10	Tailwater Habitat Alternative .....	5.15-4
5.15.11	Summary of Impacts .....	5.15-4
5.16	Shoreline Erosion .....	5.16-1
5.16.1	Introduction.....	5.16-1
5.16.2	Impact Assessment Methods .....	5.16-1
5.16.3	Base Case .....	5.16-6
5.16.4	Reservoir Recreation Alternative A .....	5.16-6
5.16.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.16-7
5.16.6	Summer Hydropower Alternative.....	5.16-7
5.16.7	Equalized Summer/Winter Flood Risk Alternative.....	5.16-7
5.16.8	Commercial Navigation Alternative .....	5.16-8
5.16.9	Tailwater Habitat Alternative .....	5.16-8
5.16.10	Summary of Impacts .....	5.16-8
5.17	Prime Farmland .....	5.17-1
5.17.1	Impact Assessment Methods .....	5.17-1
5.17.2	Base Case .....	5.17-2
5.17.3	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.17-2
5.17.4	Summer Hydropower Alternative and Equalized Summer/ Winter Flood Risk Alternative .....	5.17-2
5.17.5	Commercial Navigation Alternative .....	5.17-3
5.17.6	Summary of Impacts .....	5.17-3
5.18	Cultural Resources .....	5.18-1
5.18.1	Introduction.....	5.18-1
5.18.2	Impact Assessment Methods .....	5.18-1



5.18.3	Base Case .....	5.18-2
5.18.4	Reservoir Recreation Alternative A .....	5.18-3
5.18.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.18-3
5.18.6	Summer Hydropower Alternative.....	5.18-4
5.18.7	Equalized Summer/Winter Flood Risk Alternative.....	5.18-4
5.18.8	Commercial Navigation Alternative .....	5.18-5
5.18.9	Tailwater Habitat Alternative .....	5.18-5
5.18.10	Summary of Impacts .....	5.18-6
5.19	Visual Resources.....	5.19-1
5.19.1	Introduction.....	5.19-1
5.19.2	Impact Assessment Methods .....	5.19-1
5.19.3	Base Case .....	5.19-5
5.19.4	Reservoir Recreation Alternative A .....	5.19-5
5.19.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.19-6
5.19.6	Summer Hydropower Alternative.....	5.19-6
5.19.7	Equalized Summer/Winter Flood Risk Alternative.....	5.19-6
5.19.8	Commercial Navigation Alternative .....	5.19-7
5.19.9	Tailwater Habitat Alternative .....	5.19-7
5.19.10	Summary of Impacts .....	5.19-7
5.20	Dam Safety.....	5.20-1
5.20.1	Introduction.....	5.20-1
5.20.2	Impact Assessment Methods .....	5.20-1
5.20.3	Base Case .....	5.20-1
5.20.4	All Policy Alternatives .....	5.20-1
5.20.5	Summary of Impacts .....	5.20-2
5.21	Navigation.....	5.21-1
5.21.1	Introduction.....	5.21-1
5.21.2	Impact Assessment Methods .....	5.21-1
5.21.3	Base Case .....	5.21-2
5.21.4	Summer Hydropower Alternative.....	5.21-3
5.21.5	Equalized Summer/Winter Flood Risk Alternative.....	5.21-3
5.21.6	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Commercial Navigation Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.21-3
5.21.7	Summary of Impacts .....	5.21-5
5.22	Flood Control .....	5.22-1
5.22.1	Introduction.....	5.22-1
5.22.2	Impact Assessment Methods .....	5.22-1
5.22.3	Base Case .....	5.22-15
5.22.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Summer Hydropower Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.22-15
5.22.5	Equalized Summer/Winter Flood Risk Alternative.....	5.22-16
5.22.6	Commercial Navigation Alternative .....	5.22-17
5.22.7	Summary of Impacts .....	5.22-17
5.23	Power .....	5.23-1
5.23.1	Introduction.....	5.23-1
5.23.2	Impact Assessment Methodology.....	5.23-1

## Table of Contents

---

5.23.3	Base Case .....	5.23-4
5.23.4	Reservoir Recreation Alternative A .....	5.23-5
5.23.5	Reservoir Recreation Alternative B and Tailwater Recreation Alternative .....	5.23-9
5.23.6	Summer Hydropower Alternative.....	5.23-9
5.23.7	Equalized Summer/Winter Flood Risk Alternative.....	5.23-10
5.23.8	Commercial Navigation Alternative .....	5.23-11
5.23.9	Tailwater Habitat Alternative .....	5.23-12
5.23.10	Summary of Impacts .....	5.23-13
5.24	Recreation .....	5.24-1
5.24.1	Introduction.....	5.24-1
5.24.2	Impact Assessment Methods .....	5.24-1
5.24.3	Base Case .....	5.24-1
5.24.4	Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative .....	5.24-3
5.24.5	Summer Hydropower Alternative.....	5.24-4
5.24.6	Equalized Summer/Winter Flood Risk Alternative.....	5.24-6
5.24.7	Commercial Navigation Alternative .....	5.24-6
5.24.8	Summary of Impacts .....	5.24-7
5.25	Social and Economic Resources.....	5.25-1
5.25.1	Introduction.....	5.25-1
5.25.2	Impact Assessment Methods .....	5.25-1
5.25.3	Base Case .....	5.25-18
5.25.4	Reservoir Recreation Alternative A .....	5.25-18
5.25.5	Reservoir Recreation Alternative B .....	5.25-18
5.25.6	Summer Hydropower Alternative.....	5.25-19
5.25.7	Equalized Summer/Winter Flood Risk Alternative.....	5.25-19
5.25.8	Commercial Navigation Alternative .....	5.25-20
5.25.9	Tailwater Recreation Alternative .....	5.25-20
5.25.10	Tailwater Habitat Alternative .....	5.25-20
5.25.11	Environmental Justice .....	5.25-21
5.25.12	Summary of Impacts .....	5.25-21

## Chapter 6 – Cumulative Impacts

6.1	Introduction.....	6-1
6.2	Cumulative Impacts Associated with Future Trends .....	6-2
6.2.1	Air Resources/Climate.....	6-2
6.2.2	Water Quality.....	6-3
6.2.3	Aquatic Resources .....	6-4
6.2.4	Wetlands .....	6-4
6.2.5	Terrestrial Ecology .....	6-4
6.2.6	Vector Control .....	6-5
6.2.7	Threatened and Endangered Species.....	6-5
6.2.8	Managed Areas and Ecologically Significant Sites.....	6-6
6.2.9	Shoreline Development and Land Use.....	6-6
6.2.10	Shoreline Erosion .....	6-6
6.2.11	Prime Farmland.....	6-7
6.2.12	Cultural Resources .....	6-7
6.2.13	Flood Control.....	6-7

6.2.14	Visual Resources .....	6-7
6.2.15	Recreation .....	6-8
6.3	Cumulative Impacts of Future Projects.....	6-8
6.3.1	Identification of Future Projects.....	6-8
6.3.2	Cumulative Impacts Associated with TVA Land Management Plans .....	6-14
6.3.3	Cumulative Impacts Associated with Land Development Programs .....	6-14
6.3.4	Cumulative Impacts Associated with the Hydro Modernization Program.....	6-15
 <b>Chapter 7 – Potential Mitigation Measures</b>		
7.1	Introduction.....	7-1
7.2	Programmatic Approach to Mitigation .....	7-1
7.3	TVA Management Programs – Providing a Framework for Mitigation .....	7-2
7.4	Potential Impacts and Mitigation by Policy Alternative Formulation .....	7-8
 <b>Chapter 8 – List of Preparers</b>		
8.1	TVA Staff .....	8-1
8.2	TVA Consultants.....	8-7
 <b>Chapter 9 – Distribution List</b>		
9.1	Valley Congressional Delegation.....	9-1
9.2	Federal Agencies.....	9-2
9.3	State Agencies .....	9-5
9.4	Libraries.....	9-8
9.5	Individuals and Organizations .....	9-9
 <b>Chapter 10 – Supporting Information</b>		
10.1	Literature Cited .....	10.1-1
10.2	Glossary .....	10.2-1
10.3	Index.....	10.3-1

# **Table of Contents**

---

## **List of Appendices**

**Appendix A – Water Control System Description Tables**

**Appendix B – Reservoir Operations Study Preliminary Alternatives**

**Appendix C – Model Descriptions and Results**

**Appendix D – Additional Information for Resource Areas**

- D1. Water Quality
- D2. Groundwater Resources
- D3. Aquatic Resources
- D4. Wetlands
- D5. Terrestrial Ecology
- D6. Threatened and Endangered Species
- D7. Cultural Resources
- D8. Recreation
- D9. Inter-Basin Transfers
- D10. Social and Economic Resources

**Appendix E – Prime Farmland Technical Report**

**List of Figures**

<u>Figure</u>	<u>Page</u>
ES.2-01 TVA Water Control System .....	ES-2
1.1-01 TVA Water Control System .....	1-1
1.1-02 Tennessee River Watershed and TVA Power Service Area .....	1-3
1.6-01 Community Workshop Keypad Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities .....	1-11
1.6-02 Telephone Survey Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities .....	1-11
1.9-01 Contents of the ROS EIS .....	1-19
2.1-01 Monthly Average Rainfall and Runoff (1903 to 2001) .....	2-2
2.2-01 Schematic Diagram of the TVA Water Control System .....	2-8
2.2-02 Achieving a Balance of Reservoir System Operating Objectives (Summer/Fall).....	2-9
2.2-03 Generic Tributary Reservoir Guide Curve .....	2-12
2.2-04 Generic Mainstem Reservoir Guide Curve.....	2-13
2.3-01 Illustration of Minimum Channel Depth for Navigation .....	2-19
2.3-02 Storage of Increased Runoff to Prevent Flooding .....	2-20
2.3-03 Aeration Methods to Increase Oxygen in Water below Hydropower Projects .....	2-26
3.3-01 Example of Critical-Period Storage Versus Current Flood Guide at Chatuge Reservoir .....	3-16
4.1-01 Reservoir Operations Study Waterbodies .....	4.1-5
4.1-02 Physiographic Regions within the Tennessee River Watershed .....	4.1-10
4.2-01 Ozone Nonattainment Areas in the Tennessee Valley Region—1-Hour Standard.....	4.2-3
4.2-02 Air Quality Trends for Particulate Matter in the Tennessee Valley Region (1979 to 2000).....	4.2-5
4.2-03 Sulfur Dioxide Air Quality Trends in the Tennessee Valley Region (1979 to 2000) .....	4.2-5
4.2-04 Ozone Air Quality Trends in the Tennessee Valley Region (1979 to 2000) .....	4.2-6
4.2-05 National Park and National Wilderness Areas Designated as Air Quality Class I Areas for the Prevention of Significant Deterioration in the Tennessee Valley Region .....	4.2-8
4.2-06 Rainfall Hydrogen Ion Concentration in the Tennessee Valley Region (1979 to 2000).....	4.2-10
4.2-07 Rainfall Sulfate in the Tennessee Valley Region (1979 to 2000) .....	4.2-10
4.3-01 Precipitation Departure from the 1971 to 2000 Average in the Tennessee River Basin .....	4.3-4
4.4-01 Average Reservoir Ecological Health Score 1994 to 2001 .....	4.4-5

# Table of Contents

---

## List of Figures (continued)

<u>Figure</u>		<u>Page</u>
4.4-02	Reservoir Characteristics during Summer Pool Elevation from Spring to Early Fall .....	4.4-9
4.5-01	Water Use in the Tennessee Valley Region for 2000 and 2030 .....	4.5-3
4.5-02	Total Water Use for Thermoelectric Power, Industrial Use, and Public Supply for 2000 and 2030 .....	4.5-4
4.5-03	Consumptive Water Use for Thermoelectric Power, Industrial Use, Public Supply, and Irrigation for 2000 and 2030 .....	4.5-4
4.5-04	Consumptive Water Use Plus Water Transfers Out of the Tennessee River Watershed.....	4.5-6
4.6-01	Groundwater Withdrawals by Hydrologic Unit in the Tennessee Valley Region in 2000 .....	4.6-3
4.7-01	Diagram of Flow Zones Used in TVA Reservoir Ecological Monitoring .....	4.7-11
4.8-01	Wetlands of the TVA Reservoir System by Vegetation Class .....	4.8-8
4.8-02	Wetland Reservoir Types and Locations (Lacustrine Wetlands).....	4.8-8
4.8-03	Tailwater Reservoir Types and Locations (Riverine Wetlands).....	4.8-9
4.8-04	Other Wetland Types and Positions within the Area of Groundwater Influence (Palustrine System) .....	4.8-10
4.8-05	Wetlands of the TVA Reservoir System by Water Regime .....	4.8-12
4.9-01	Aquatic Plant Coverage on TVA Mainstem Reservoirs (1976 to 2002) .....	4.9-9
4.9-02	Generalized Diagram of Aquatic Plant Zones in a TVA Mainstem Storage Reservoir .....	4.9-11
4.15-01	Section 26a Permit Approvals of Structures Related to Shoreline Recreation at Norris and Pickwick Reservoirs .....	4.15-5
4.16-01	Reservoir Shoreline Erosion Rankings (Percent).....	4.16-5
4.17-01	Farmland Conversion within Counties in the Tennessee River Watershed (1987 to 1997).....	4.17-7
4.19-01	The "Ring Effect" from Lower Water Levels—Observed from Fontana Reservoir at an Overlook Site near the Dam.....	4.19-9
4.19-02	The Effects of Lower Pool Levels in Exposing Reservoir Bottom and Flats—Boone Reservoir Observed from a Rural Road Adjacent to a Residential Area .....	4.19-11
4.19-03	The Effects of Lower Pool Levels—Upper Boone Reservoir Observed from Highway 11E near Bluff City .....	4.19-12
4.19-04	Effects of Floating Structures Sitting on Exposed Reservoir Bottom and Other Exposed Structures, Resulting in Lowered Scenic Integrity .....	4.19-14
4.21-01	Inland Navigation System for the Tennessee River and Connecting River Systems .....	4.21-2
4.22-01	Simulated Flood Flow Frequency for Chickamauga Dam (1903 to 2001) .....	4.22-4

**List of Figures (continued)**

<u>Figure</u>	<u>Page</u>
4.22-02 Simulated Peak Flow under Existing Operations Policy for the Historical Inflows at Six Flood Damage Centers in the Tennessee Valley Region .....	4.22-4
4.22-03 Peak Discharges from Hypothetical Design Storms for Chickamauga Dam (Scaling Factor 1.50) .....	4.22-6
4.22-04 Simulated Peak Flow from 69 Hypothetical Design Storms (2.00 Scaling Factor) at Seven Flood Damage Centers in the Tennessee Valley Region .....	4.22-6
4.22-05 Estimated Peak Flood Damage from 99-Year Continuous Simulation at 10 Flood Damage Centers in the Tennessee Valley Region .....	4.22-8
4.23-01 Typical Dispatch of TVA Generating Reserouces to Meet Daily Power Demand (July 11, 2000) .....	4.23-6
4.24-01 Annual Recreation Use (User Days) of the 35 ROS Projects by Public Access, Private Access, and Commercial Site Users (2002) .....	4.24-5
4.24-02 Comparative Public Access Recreation Use at ROS Reservoirs and Tailwaters (2002) .....	4.24-6
4.24-03 Reservoir Use (User Days) by Season at Public Access Sites (2002) .....	4.24-6
4.24-04 Public Access Use (User Days) at ROS Tailwaters (2002) .....	4.24-7
4.24-05 User Profiles for Public Access Recreation Use at ROS Reservoirs (2002) .....	4.24-8
4.24-06 Commercial Recreation Use Activities by Project (2002) .....	4.24-10
4.24-07 Commercial Recreation Use at the 35 Reservoirs Studied in the ROS (2002) .....	4.24-11
4.24-08 Private Recreation Use by Project Type (2002) .....	4.24-14
4.24-09 Private Recreation Use at the 35 Reservoirs Studied in the ROS (2002) .....	4.24-14
4.25-01 Projected External Recreation Expenditures during August through October across the TVA System under Existing Reservoir Operating Policy .....	4.25-19
5.2-01 Comparison of Air Pollutant Emissions by Policy Alternative .....	5.2-5
5.2-02 Comparison of Policy Alternatives by Season .....	5.2-5
5.3-01 Comparison of Changes in Annual Total TVA CO <sub>2</sub> Emissions by Policy Alternative .....	5.3-2
5.22-01 Simulated Annual Flood Flow Frequency for Chickamauga Dam (1903 to 2001) .....	5.22-3
5.22-02a Increase in Simulated Peak Flow for Largest Event in 99-Year Period of Record for Six Flood Damage Centers in the Tennessee Valley Region under Reservoir Recreation Alternative A .....	5.22-4
5.22-02b Increase in Simulated Peak Elevation for Largest Event in 99-Year Period of Record for 10 Flood Damage Centers in the Tennessee Valley Region under Reservoir Recreation Alternative A .....	5.22-4

## Table of Contents

---

### List of Figures (continued)

<u>Figure</u>	<u>Page</u>
5.22-03 Peak Discharges from Hypothetical Design Storms for Chickamauga Dam (Scaling Factor 1.50) .....	5.22-5
5.22-04 Simulated Annual Elevation Frequency in Chattanooga, TN (1903 to 2001) .....	5.22-6
5.22-05 Expected Additional Dollar Damage at Chattanooga by Policy Alternative Evaluated in Detail Relative to the Base Case for the Largest Event in 99-Year Period of Record.....	5.22-13
5.22-06 Expected Change in Average Annual Damage at Chattanooga by Policy Alternative Evaluated in Detail Relative to the Base Case for the 99-Year Period of Record.....	5.22-14
5.24-01 Changes in Recreation during August through October (2002) by Policy Alternative.....	5.24-4
5.24-02 Percent Changes in Recreation Use by Recreation User Type during August through October (2002) by Policy Alternative .....	5.24-5
5.25-01 Projected External Recreation Expenditures by Policy Alternative (August through October).....	5.25-7



**List of Tables**

<u>Table</u>	<u>Page</u>
ES-01	Summary of Policy Alternative Performance by Objectives Identified during Public Scoping..... ES-10
ES-02	Summary of Impacts by Policy Alternative ..... ES-13
ES-03	Annual Economic Effects of Policy Alternatives Based on Changes in Gross Regional Product (2010)..... ES-22
1.6-01	Community Workshops Held during the Scoping Process..... 1-9
1.6-02	Public Feedback Provided during the Scoping Process..... 1-10
1.6-03	Operating Options Developed during the Scoping Process ..... 1-13
2.1-01	Characteristics of TVA Reservoirs ..... 2-4
3.3-01	General Description of Operations under the Base Case and the Reservoir Operations Policy Alternatives That Were Evaluated in Detail ..... 3-6
3.5-01	Summary of Policy Alternative Performance by Objectives Identified during Public Scoping..... 3-26
3.5-02	Summary of Impacts by Policy Alternative ..... 3-29
3.5-03	Annual Economic Effects of Policy Alternatives Based on Changes in Gross Regional Product (2010)..... 3-39
4.1-01	Resource Areas Included in the EIS and Focus of Discussion ..... 4.1-2
4.1-02	ROS Waterbodies Classifications ..... 4.1-6
4.1-03	Physiographic Regions of the Tennessee Valley ..... 4.1-11
4.2-01	National Ambient Air Quality Standards ..... 4.2-2
4.2-02	Summary of TVA Power Plant Emissions of Air Pollutants ..... 4.2-7
4.3-01	Average Temperatures and Departures for the TVA Power Service Area..... 4.3-3
4.3-02	Greenhouse Gas Emissions (millions of tons) (1990 to 2001) ..... 4.3-5
4.4-01	Ecological Health Indicators for TVA Reservoirs in the ROS (2000 and 2001) ..... 4.4-6
4.4-02	Physical Characteristics of Selected TVA Reservoirs ..... 4.4-8
4.6-01	Summary of Aquifer Properties for the Physiographic Regions in the Tennessee River Region..... 4.6-2
4.6-02	Public Groundwater Supplies within 1 Mile of Reservoir and Tailwater Areas ..... 4.6-4
4.7-01	Key Issues Identified for Assessment of Potential Impacts on Aquatic Resources in the TVA Reservoir System ..... 4.7-3
4.7-02	Data Sources Used to Characterize Existing Conditions of Key Issues..... 4.7-4
4.7-03	Impacts of Reservoirs on Aquatic Environment of Regulated Rivers..... 4.7-7
4.7.04	Average Benthic Metric Score for Reservoir Samples Collected (1994 through 2001)..... 4.7-12

# Table of Contents

---

## List of Tables (continued)

<u>Table</u>	<u>Page</u>
4.7-05 Summary of Scores for the Reservoir Fish Assemblage Index Samples (1993 to 2001) .....	4.7-14
4.7-06 Number of Sites in Each Scoring Category in Tailwaters Using the Fish Index of Biotic Integrity .....	4.7-16
4.7-07 Number of Sites in Each Scoring Category of the Tailwater Benthic Index Samples.....	4.7-17
4.7-08 Average Reservoir Scores for Sport Fish Index Based on Samples from 1997 to 2000 .....	4.7-21
4.8-01 Wetland Amounts for Reservoirs and Tailwaters in the ROS EIS .....	4.8-3
4.8-02 Wetlands with Water-Level Control Structures.....	4.8-6
4.9-01 Invasive or Nuisance Aquatic Plants of Concern to TVA .....	4.9-2
4.9-02 Aquatic Plant Coverage on TVA Mainstem Reservoirs (1976 to 2002) .....	4.9-4
4.9-03 Aquatic Plant Species on TVA Mainstem Reservoirs.....	4.9-12
4.9-04 Submersed and Floating-Leaved Aquatic Macrophytes Occurring along Rivers of the Tennessee River System .....	4.9-15
4.10-01 Globally Imperiled Wetland Plant Communities Known to Occur in the Study Area.....	4.10-3
4.10-02 Globally Imperiled Wetland Plant Communities not Known but with Potential to Occur in the Study Area .....	4.10-4
4.10-03 Representative Tree Species Found in Bottomland Hardwood Forests .....	4.10-6
4.10-04 Representative Tree and Shrub Species Found in Scrub/Shrub Wetlands .....	4.10-7
4.10-05 Representative Plant Species Found on TVA Reservoir Flats.....	4.10-7
4.13-01 Summary Protection Statistics about the Endangered, Threatened, and Special-Concern Species Known from within 1 Mile or (in parentheses) within 200 Feet around the Waterbodies Included in the ROS.....	4.13-4
4.13-02 Summary Statistics about the Typical Habitats of the Endangered, Threatened, and Special-Concern Species that Exist within 1 Mile or (in parentheses) 200 Feet around the Waterbodies Included in the ROS.....	4.13-6
4.13-03 Summary Statistics about the Known Occurrences of Endangered, Threatened, and Special-Concern Species within 1 Mile or (in parentheses) 200 Feet around the Waterbodies Included in the ROS Arranged by Waterbody Category.....	4.13-9
4.14-01 Number of Managed Areas and Ecologically Significant Sites by Reservoir .....	4.14-3
4.14-02 Managed Areas and Ecologically Significant Sites from Seven Representative Rivers/Reservoirs in the TVA System .....	4.14-6
4.14-03 Shoreline Miles of Managed Areas and Ecologically Significant Sites for Seven Representative Reservoirs in the TVA System.....	4.14-16

**List of Tables (continued)**

<u>Table</u>	<u>Page</u>
4.15-01 The USGS Land-Use Classification System, as Simplified .....	4.15-4
4.15-02 Shoreline Development for Reservoirs Considered in the Land Use Analysis .....	4.15-6
4.16-01 Representative Reservoirs Used in the Erosion Analysis .....	4.16-2
4.16-02 Reservoir Shoreline Erosion Conditions from TVA Automated Land Information System (ALIS) Data .....	4.16-4
4.16-03 Tailwater Shoreline Erosion Conditions .....	4.16-6
4.17-01 Acreage of Prime Farmland in the Tennessee River Watershed .....	4.17-3
4.17-02 Land Use of Prime Farmland within 0.25 Mile of Representative Reservoirs .....	4.17-4
4.17-03 Acreage of Farmland by Reservoir Grouping .....	4.17-5
4.17-04 Projection of Prime Farmland Conversion within 0.25 Mile of Representative Reservoirs .....	4.17-8
4.18-01 Numbers of Archaeological Sites in the Area of Potential Effects .....	4.18-3
4.18-02 Cultural Affiliation of Archaeological Sites Located between Summer and Winter Pool Elevations .....	4.18-4
4.18-03 Cultural Affiliation of Archaeological Sites in the Area of Potential Effect .....	4.18-5
4.18-04 Numbers of Historic Structures in the Area of Potential Effects .....	4.18-7
4.19-01 Primary Visual Attributes of Representative Reservoirs .....	4.19-2
4.19-02 Existing Scenic Conditions for Representative Reservoirs .....	4.19-4
4.20-01 Drawdown Limits for Tributary Reservoirs .....	4.20-4
4.20-02 Leakage Monitored at Non-Power and Power Projects .....	4.20-5
4.21-01 Tennessee River Tonnages by Traffic Category .....	4.21-4
4.21-02 Tennessee River Tonnages by Commodity Group .....	4.21-4
4.21-03 Regional Economic Development Tennessee River Tonnages by Commodity Group .....	4.21-5
4.23-01 Key Characteristics of the Power System Generation Resources .....	4.23-5
4.23-02 Power Generation Resources .....	4.23-7
4.24-01 General Characteristics of the ROS Projects .....	4.24-2
4.24-02 Comparisons of Types of Recreation Use at Public Access Sites at Six TVA Projects .....	4.24-9
4.24-03 Commercial Recreational Activities across All Affected Reservoirs .....	4.24-12
4.24-04 Private Recreation Activity Profiles at the 13 Surveyed Projects .....	4.24-16
4.25-01 Population in the ROS Analysis Area (1980–2000) (thousands) .....	4.25-3
4.25-02 Population Forecast for the ROS Analysis Area (2004 to 2030) (thousands) .....	4.25-4
4.25-03 Employment in the ROS Analysis Area (1980 to 2000) (thousands) .....	4.25-5

# Table of Contents

---

## List of Tables (continued)

<u>Table</u>	<u>Page</u>
4.25-04 Labor Force and Unemployment in the ROS Analysis Area (2000) (average annual in thousands).....	4.25-6
4.25-05 Employment by Economic Sector in the ROS Analysis Area (2000) (thousands) .....	4.25-6
4.25-06 Employment Forecast in the ROS Analysis Area (2004 to 2030) (thousands) .....	4.25-7
4.25-07 Total Personal Income in the ROS Analysis Area (2002 dollars in billions) .....	4.25-8
4.25-08 Total Income Forecast in the ROS Analysis Area (2004 to 2030) (2002 dollars in billions).....	4.25-9
4.25-09 Gross Regional Product in the ROS Analysis Area (2002 dollars in billions) .....	4.25-10
4.25-10 Gross Regional Product Forecast (2004 to 2030) (2002 dollars in billions) .....	4.25-11
4.25-11 Environmental Justice Populations in the ROS Analysis Area (thousands) .....	4.25-12
4.25-12 Total Power Sales Revenue in the TVA Power Service Area (2004 to 2030) (2002 dollars in millions) .....	4.25-14
4.25-13 Tennessee River Tonnage that Originated and Terminated on the Tennessee or Cumberland River Systems (1980 to 2000) .....	4.25-15
4.25-14 Total Traffic on the Tennessee and Cumberland River Systems Less Through-Movement (2004 to 2030) (millions of tons) .....	4.25-16
4.25-15 Total Shipper Savings by Commodity for the TVA Region under Existing Conditions and Future Trends (2002 dollars in millions) .....	4.25-16
4.25-16 Annual Expenditures within TVA Economic Sub-Regions (2004 to 2030) (2002 dollars in millions) .....	4.25-18
4.25-17 Median Values for Properties Adjacent to ROS Reservoirs (thousands) .....	4.25-20
5.2-01 Summary of Annual Emission Increases/Decreases by Policy Alternative (Based on PROSYM Model Outputs for 2005) (in tons per year) .....	5.2-3
5.2-02 Increases/Decreases of Nitrogen Oxides Emissions due to Policy Alternatives (in tons).....	5.2-4
5.2-03 Summary of Impacts on Air Resources by Policy Alternative .....	5.2-9
5.3-01 Summary of Impacts on Climate by Policy Alternative .....	5.3-5
5.4-01 Water Quality Metrics Used to Evaluate Policy Alternatives .....	5.4-4
5.4-02 Summation of Responses for Water Quality Characteristics in Representative Reservoirs by Policy Alternative.....	5.4-6
5.4-03 Summation of Responses for Water Quality Characteristics in Representative Dam Releases by Policy Alternative .....	5.4-9

**List of Tables (continued)**

<u>Table</u>	<u>Page</u>
5.4-04 Summary of Impacts on Assimilative Capacity and Anoxia by Policy Alternative .....	5.4-19
5.5-01 Comparison of TVA-Published Minimum Reservoir Elevations to Existing and Proposed Elevations.....	5.5-2
5.5-02 2030 Total Average Water Supply Pumping Rates.....	5.5-5
5.5-03 Change in Pumping Energy Required for Policy Alternatives .....	5.5-6
5.5-04 Comparison of Maximum Algae Concentrations by Policy Alternative.....	5.5-7
5.5-05 Impacts on Water Supply by Policy Alternative.....	5.5-10
5.5-06 Summary of Impacts on Water Supply by Policy Alternative .....	5.5-11
5.6-01 Public Groundwater Wells within Maximum Zones of Influence of TVA Reservoirs .....	5.6-2
5.6-02 Summary of Potential Impacts on Groundwater Resources by Policy Alternative .....	5.6-5
5.7-01 Environmental Factors Used to Evaluate Potential Changes among Species or Communities by Policy Alternative .....	5.7-2
5.7-02 Comparison of Reservoir Dissolved Oxygen Metrics by Policy Alternative .....	5.7-9
5.7-03 Comparison of Reservoir Hydrology Metrics.....	5.7-11
5.7-04 Comparison of Summer Tailwater Metric Values for Tailwaters by Policy Alternative.....	5.7-13
5.7-05 Comparison of August-September Tailwater Metric Values by Policy Alternative .....	5.7-15
5.7-06 Comparison of Water Temperature Metric Values for Tailwaters by Policy Alternative.....	5.7-17
5.7-07 Comparison of Cool-Water Habitat Reservoir Metrics by Policy Alternative .....	5.7-18
5.7-08 Comparison of Cold-Water Habitat Reservoir Metrics by Policy Alternative .....	5.7-19
5.7-09 Estimated Values for Flowing Mainstem Waterbodies .....	5.7-19
5.8-01 Summary of Impacts on Wetland Resources by Policy Alternative.....	5.8-10
5.9-01 Impact Analysis Considerations Related to Aquatic Plants by Operating Option .....	5.9-5
5.9-02 Summary of Impacts on Aquatic and Invasive Aquatic Plants by Policy Alternative .....	5.9-6
5.10-01 Summary of Potential Impacts on Terrestrial Ecology by Policy Alternative .....	5.10-8
5.11-01 Summary of Impacts on Invasive Terrestrial and Aquatic Animals and Terrestrial Plants by Policy Alternative.....	5.11-6
5.12-01 Summary of Impacts on Mosquito Population Abundance by Policy Alternative .....	5.12-4

# Table of Contents

---

## List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.13-01	Number of Protected Species Included in Each Part of the Direct Effects Evaluation.....5.13-2
5.13-02	Flowing-Water Habitat Evaluation Metrics .....5.13-4
5.13-03	Summary of Direct Effects on Threatened and Endangered Species for Mainstem Reservoirs and Tailwaters .....5.13-5
5.13-04	Summary of Direct Effects Metrics Related to Protected Species for Warm and Cool-to-Warm Tributary Tailwaters.....5.13-6
5.13-05	Summary of Impacts on Endangered, Threatened, and Other Protected Species by Policy Alternative.....5.13-19
5.14-01	Summary of Impacts on Managed Areas and Ecologically Significant Sites by Policy Alternative .....5.14-6
5.15-01	Summary of Impacts on Land Use by Policy Alternative.....5.15-6
5.16-01	Duration at High-Pool Elevations for Representative Reservoirs by Policy Alternative.....5.16-4
5.16-02	Comparison of Policy Alternative High-Flow Periods to Base Case for Representative Reservoirs .....5.16-5
5.16-03	Summary of Change from Base Case in Recreation Use by Policy Alternative (August, September, and October) .....5.16-6
5.16-04	Summary of Impacts on Shoreline Erosion by Policy Alternative.....5.16-9
5.17-01	Summary of Impacts on Prime Farmland and Soils by Policy Alternative .....5.17-4
5.18-01	NRHP Archaeological Sites by Zone and Policy Alternative .....5.18-2
5.18-02	Relative Ranking of Impacts by Policy Alternative .....5.18-7
5.19-01	Water Level Fluctuations for Representative Reservoirs by Policy Alternative .....5.19-2
5.19-02	Duration at High-Pool Elevations for Representative Reservoirs by Policy Alternative.....5.19-3
5.19-03	Late October Median-Pool Level for Representative Reservoirs by Policy Alternative.....5.19-4
5.19-04	Summary of Effects on Scenic Integrity by Policy Alternative .....5.19-8
5.20-01	Summary of Impacts on Dam Safety by Policy Alternative .....5.20-3
5.21-01	Tennessee River Shipper Savings under the Base Case .....5.21-3
5.21-02	Tennessee River Shipper Savings under the Commercial Navigation Alternative .....5.21-4
5.21-03	Summary of Impacts on Navigation by Policy Alternative .....5.21-6
5.22-01	Critical Locations for Evaluation of Flood Risk Potential .....5.22-1
5.22-02	Summary Matrix Evaluation of the Effect of Reservoir Recreation Alternative A on Flood Risk.....5.22-8
5.22-03	Summary Matrix Evaluation of the Effect of Reservoir Recreation Alternative B on Flood Risk.....5.22-9

## List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.22-04 Summary Matrix Evaluation of Effect of the Equalized Summer/Winter Flood Risk Alternative on Flood Risk .....	5.22-10
5.22-05 Summary Matrix Evaluation of Effect of the Commercial Navigation Alternative on Flood Risk .....	5.22-11
5.22-06 Summary Matrix Evaluation of Effect of the Tailwater Habitat Alternative on Flood Risk .....	5.22-12
5.22-07 Summary of Impacts on Flood Control by Policy Alternative .....	5.22-18
5.23-01 Effect of Policy Alternatives on Hydropower Generation Relative to the Base Case.....	5.23-6
5.23-02 Effect of Alternatives on Shift of Hydropower Generation Relative to the Base Case.....	5.23-7
5.23-03 Impacts to Power Generation—Net Present Value of Production Costs (2004 to 2010).....	5.23-8
5.23-04 Summary of Impacts on Power by Policy Alternative .....	5.23-15
5.24-01 Recreational Use by Policy Alternative (August through October).....	5.24-2
5.24-02 Summary of Changes in Recreational Use by Policy Alternative (August, September, and October) .....	5.24-8
5.25-01 Power Cost Change as a Percent of TVA Total Revenue (2004 to 2030) (percent).....	5.25-3
5.25-02 Forecast Shipper Savings under the Base Case (2004 to 2030) (2002 dollars in millions).....	5.25-4
5.25-03 Changes in Shipper Savings by Policy Alternative (2004 to 2030) (2002 dollars in millions).....	5.25-4
5.25-04 Cost to Modify Intakes on Reservoirs with Pool Levels below TVA-Published Minimum Elevations by Policy Alternative (2002 dollars in thousands).....	5.25-6
5.25-05 Changes in Recreational Expenditures from outside the TVA Region (August through October) (2002 dollars in millions) .....	5.25-8
5.25-06 Estimated Impacts of Changes in Property Values on Consumer Spending across the TVA Region by Policy Alternative (2004 to 2030) (2002 dollars in millions) .....	5.25-10
5.25-07 Total Economic Effects on Consumer Spending under Reservoir Recreation Alternative A (2004 to 2030) .....	5.25-11
5.25-08 Total Economic Effects on Consumer Spending under Reservoir Recreation Alternative B (2004 to 2030) .....	5.25-12
5.25-09 Total Economic Effects on Consumer Spending under the Summer Hydropower Alternative (2004 to 2030).....	5.25-13
5.25-10 Total Economic Effects on Consumer Spending under the Equalized Summer/Winter Flood Risk Alternative (2004 to 2030) .....	5.25-14
5.25-11 Total Economic Effects on Consumer Spending under the Commercial Navigation Alternative (2004 to 2030).....	5.25-15

## Table of Contents

---

### List of Tables (continued)

<u>Table</u>	<u>Page</u>
5.25-12 Total Economic Effects on Consumer Spending under the Tailwater Recreation Alternative (2004 to 2030).....	5.25-16
5.25-13 Total Economic Effects on Consumer Spending under the Tailwater Habitat Alternative (2004 to 2030).....	5.25-17
5.25-14 Direct Effects by Policy Alternative.....	5.25-19
5.25-15 Summary of Economic Effects by Policy Alternative.....	5.25-23
6.3-01 Summary of Projects Included in the Cumulative Analysis .....	6-10
6.3-02 Hydro Modernization Projects Considered in Cumulative Impact Analysis .....	6-16
7.3-01 TVA Program Elements and Activities Relevant to Mitigation .....	7-3



**List of Acronyms**

<b>AHPA</b>	Archaeological and Historic Preservation Act
<b>ALIS</b>	Automated Land Information Systems
<b>AQRV</b>	Air quality-related values
<b>APE</b>	Area of potential effect
<b>ARPA</b>	Archeological Resources Protection Act
<b>BIBI</b>	Benthic Index of Biotic Integrity
<b>BMPs</b>	Best management practices
<b>CAA</b>	Clean Air Act
<b>CEQ</b>	Council on Environmental Quality
<b>cfs</b>	Cubic feet per second
<b>CO</b>	Carbon monoxide
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CWA</b>	Clean Water Act
<b>CWIS</b>	Cooling water intake structures
<b>DBP</b>	Disinfection by-product
<b>DEIS</b>	Draft Environmental Impact Statement
<b>DO</b>	Dissolved oxygen
<b>DOM</b>	Dissolved organic matter
<b>EA</b>	Environmental Assessment
<b>EIS</b>	Environmental Impact Statement
<b>ELCP</b>	Emergency Load Curtailment Plan
<b>ESA</b>	Endangered Species Act
<b>FEMA</b>	Federal Emergency Management Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FPPA</b>	Farmland Protection and Policy Act
<b>GDP</b>	Gross domestic product
<b>GIS</b>	Geographic Information System
<b>GRP</b>	Gross regional product
<b>ha</b>	Hectares
<b>HAP</b>	Hazardous air pollutant
<b>HMOD Program</b>	Hydro Modernization Program
<b>HPA</b>	Habitat protection area
<b>IAT</b>	Interagency Team
<b>IAT/PRG</b>	Interagency Team and Public Review Group
<b>IBI</b>	Index of Biotic Integrity
<b>IBT</b>	Inter-basin transfer
<b>IDF</b>	Inflow design flood
<b>LMP</b>	Land Management Plan

### List of Acronyms (continued)

<b>LOLP</b>	Loss of load probability
<b>m</b>	Meter
<b>Mg/L</b>	Milligrams per liter
<b>mgd</b>	Million gallons per day
<b>MOG</b>	Minimum operations guide
<b>MPF</b>	Maximum probable flood
<b>MW</b>	MegaWatt
<b>NAAQS</b>	National ambient air quality standards
<b>NEPA</b>	National Environmental Policy Act
<b>NERC</b>	North American Electric Reliability Council
<b>NFIP</b>	National Flood Insurance Program
<b>NHPA</b>	National Historic Preservation Act
<b>NO<sub>2</sub></b>	Nitrogen dioxide
<b>NOM</b>	Natural organic material
<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>NRC</b>	Nuclear Regulatory Commission
<b>NRCS</b>	Natural Resources Conservation Service
<b>NRHP</b>	National Register of Historic Places
<b>NWI</b>	National Wetlands Inventory
<b>NWR</b>	National wildlife refuge
<b>NWS</b>	National Weather Service
<b>O<sub>3</sub></b>	Ozone
<b>Pb</b>	Lead
<b>PCB</b>	Polychlorinated biphenyl
<b>PI</b>	Personal income
<b>PM<sub>2.5</sub></b>	Particulate matter whose particles are # 2.5 micrometers
<b>PM<sub>10</sub></b>	Particulate matter whose particles are # 10 micrometers
<b>PMF</b>	Probable maximum flood
<b>PPS</b>	Population Protection Planning Site
<b>PRG</b>	Public Review Group
<b>RED</b>	Regional Economic Development
<b>REITS</b>	Real estate investment trusts
<b>REMI</b>	Regional Economic Model, Inc
<b>RFAI</b>	Reservoir Fisheries Assemblage Index
<b>ROS</b>	Reservoir Operations Study
<b>RRI Program</b>	Reservoir Release Improvements Program
<b>RTS</b>	Reservoir-triggered seismicity
<b>SAHI</b>	Shoreline Aquatic Habitat Index

### List of Acronyms (continued)

<b>SAMI</b>	Southern Appalachian Mountains Initiative
<b>SERC</b>	Southeastern Electric Reliability Council
<b>SFI</b>	Sport Fish Index
<b>SFRA</b>	Southern Forest Resource Assessment
<b>SIP</b>	State implementation plan
<b>SMP</b>	Shoreline Management Policy
<b>SMS</b>	Scenery Management System
<b>SO<sub>2</sub></b>	Sulfur dioxide
<b>TDEC</b>	Tennessee Department of Environment and Conservation
<b>The Board</b>	TVA Board of Directors
<b>Valley</b>	Tennessee River Valley
<b>TMDL</b>	Total maximum daily loads
<b>TOC</b>	Total organic carbon
<b>TRM</b>	Tennessee River Mile
<b>TVA</b>	Tennessee Valley Authority
<b>TWRA</b>	Tennessee Wildlife Resources Agency
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USEPA</b>	U.S. Environmental Protection Agency
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>VOC</b>	Volatile organic compound
<b>WMA</b>	Wildlife management area
<b>WSM</b>	Weekly Scheduling Model

# Table of Contents

## Metric Conversion Chart

### Metric to U.S. Customary

Multiply	By	To Obtain
Millimeters (mm)	0.03937	Inches
Centimeters (cm)	0.3937	Inches
Meters (m)	3.281	Feet
Kilometers (km)	0.6214	Miles
Square meters (m <sup>2</sup> )	10.76	Square feet
Square kilometers (km <sup>2</sup> )	0.3861	Square miles
Hectares (ha)	2.471	Acres
Liters (l)	0.2642	Gallons
Cubic meters (m <sup>3</sup> )	35.31	Cubic feet
Cubic meters	0.0008110	Acre-feet
Milligrams (mg)	0.00003527	Ounces
Grams (g)	0.03527	Ounces
Kilograms (kg)	2.205	Pounds
Metric tons (t)	2205.0	Pounds
Metric tons	1.102	Short tons
Kilocalories (kcal)	3.968	BTU
Celsius degrees	1.8(°C) +32	Fahrenheit degrees

### U.S. Customary to Metric

Multiply	By	To Obtain
Inches	25.40	Millimeters
Inches	2.54	Centimeters
Feet (ft)	0.3048	Meters
Fathoms	1.829	Meters
Miles (mi)	1.609	Kilometers
Nautical miles (nmi)	1.852	Kilometers
Square feet (ft <sup>2</sup> )	0.0929	Square meters
Acres	0.4047	Hectares
Square miles (mi <sup>2</sup> )	2.590	Square kilometers
Gallons (gal)	3.785	Liters
Cubic feet (ft <sup>3</sup> )	0.02831	Cubic meters
Acre-feet	1233.0	Cubic meters
Ounces (oz)	28.35	Grams
Pounds (lb)	0.4536	Kilograms
Short tons (ton)	0.9072	Metric tons
British thermal units (BTU)	0.2520	Kilocalories
Fahrenheit degrees	0.5556 (°F –32)	Celsius degrees